Amendment to the Specification:

Replace paragraph [0005] with the following amended paragraph:

[0005] Therefore, there exists a further need for a system or method to accurately forecast the impact of promotions and to automate these tasks. ~~It is a further goal of the present invention to provide a system and method to automatically determine the best allocation of promotional expenditure.~~

Delete paragraph [0006].

Replace paragraph [0007] with the following amended paragraph:

[0007] In response to these and other needs, the present invention provides a promotion pricing system and a related model for producing a value evaluation and recommendation for promotion on a targeted product so as to analyze, evaluate, improve, and design promotions to meet a user's need. The promotion pricing system generates promotion price evaluations and recommendations for each product promotion related to a target product of a user along with associated competing products from the user and competitors. The user can be an individual, an organization, a corporation, an association or any entity providing~~, including~~ activities related to making, selling, resale, offering for sale, distributing and other commercial conducts, products or service or both in the stream of commerce.

Replace paragraph [0013] with the following amended paragraph:

[0013] In the preferred embodiment, the promotion pricing system of the present ~~presenting~~ invention is comprised of modularization of the necessary analytical steps along with specifications for these modules. These modules cooperate to implement statistical market response estimation that provides statistically stable, fact-based information on customer response to promotions. The modules further allow data capture to leverage enterprise and supply chain data sources. The modules include a product segmentation module, an incentive translation module, a customer segmentation module, a data aggregation module, a model selection module, a calibration module, an evaluation module, a constraints generation module, a cost structure module, an optimization module, a market channel performance module, and an alert module.

Replace paragraph [0017] with the following amended paragraph:

[0017] A more complete understanding of the present invention and advantages thereof may be acquired by referring to the following description taken in conjunction with the accompanying drawings, in which like reference numbers indicate like features, and wherein:

FIG. 1A illustrates a ~~FIGS. 1A-C illustrate~~ block diagram ~~diagrams~~ of a promotion pricing system ~~in accordance with embodiments of the present invention~~;

~~FIGS. 2-13 represent steps in the operation of various components of the promotion pricing system of FIGS. 1A-1C;~~

FIG. 1B illustrates a distributed computer network for executing the promotion price system;

FIG. 1C illustrates the interaction between promotion pricing system, market manager, and demand forecaster;

FIG. 2 illustrates the steps involved in collecting, organizing, and presenting product data for the product segmentation module;

FIG. 3 illustrates the steps involved in segmenting customers by demographics and market characteristics;

FIG. 4 illustrates the steps involved in providing incentive typing of the analyzed products;

FIG. 5 illustrates the steps involved in aggregating historical promotional data for the analyzed products;

FIGs. 6A-6B illustrate the steps involved in selecting a model for analyzing the aggregated product data;

FIG. 7 illustrates the steps involved in calibrating the selected model;

FIG. 8 illustrates the steps involved in estimating the effect of promotional schemes on profit;

FIG. 9 illustrates the steps involved in defining constraints on variables in the selected model;

FIG. 10 illustrates the steps involved in determining costs associated with the promotion schemes;

FIG. 11 illustrates the steps involved in determining optimal discount for the analyzed products and ranking the products by profitability;

FIG. 12 illustrates the steps involved in maximizing market investment return for the analyzed products;

FIG. 13 illustrates the steps involved in alerting the user to market trends for the analyzed products; and

FIG. 14 represents a user configurable pricing optimization system ~~in accordance with embodiments of the present invention~~.

Replace paragraph [0019] with the following amended paragraph:

[0019] In various implementations of the preferred embodiment, the promotion pricing system 100 includes combinations of the following components: A product segmentation module ("PSM") 200, an incentive translation module ("ITM") 400 ~~300~~, a customer segmentation module ("CUSM") 300 ~~400~~, a data aggregation module ("DAM") 500, a model selection module ("MSM") 600, a calibration module ("CM") 700, an evaluation module ("EM") 800, a constraints generation module ("CGM") 900, a cost structure module ("COSM") 1000, an optimization module ("OM") 1100, a market channel performance module ("MCPM") 1200, and an alert module ("AM") 1300. Each of these components 200-1300 may generally function as software applications that coexist on a single computer. Alternatively, the components may operate concurrently on independent computers, while interacting and exchanging data using known communication and networking techniques. The components 200-1300, as well as the general operation of the promotion pricing system 100, are now described in greater detail below. However, the general, overall operation of the promotion pricing system is first provided.

Replace paragraph [0027] with the following amended paragraph:

[0027] Another functionality of the promotion system 100 is mark-down optimization. A retailer may receive shipments of excess inventory to their stores. The retailer knows how much

of this inventory is normally sold within a given period of time given historical information and general business knowledge. However, they do not know the optimal discount to set to achieve the objective of selling that inventory within the specified time period. In other words, the user does not want to overdiscount a product. ~~promotion~~ Promotion system 100 can solve this type of problem given certain inputs such as the target product, the total initial inventory for that product, and the amount of inventory that is to be sold for a given period. Promotion system 100 would then compute that discount which maximizes profit while clearing pre-identified excess inventory during the specified period.

Replace paragraph [0031] with the following amended paragraph:

[0031] The CUSM 300 defines and categorizes the consumers of the products specified by the PSM 200 in the product segmentation method 210. The user may manually provide data for the segmentation of the customers or, more typically, the CUSM 300 may automatically segment the customer according to various demographic or market information. The CUSM 300 preferably automatically segments the customers using various characteristics. For instance, commercial consumers may be divided into categories of differing business sizes and revenue levels. The CUSM 300 may operate using a customer segmentation method 310, as illustrated in FIG. 3. In the customer segmentation method 310, the CUSM 300 first collects a list of customers for the products defined by the PSM 200. As with the PSM 200, the CUSM 300 may either receive the customer list from an external source, step 320, or the CUSM 300 may automatically

generate the customer list, step 330. For instance, the CUSM 300 may analyze a record of past transactions involving the products designated by the PSM 200. The CUSM 300 next reviews customer characteristics, step 340. The analysis of the customers may be generally accomplished by organizing the customer data into a relational database and then employing SQL to organize the customer data according to desired characteristics, such as geographic location. The CUSM 300 then divides the customers into different possible global customer segmentations, each with two or more segments, step 350. Using historical transaction data, the CUSM 300 may further determine cross impacts between customer segments, step 360. The CUSM 300 then keeps only the customer segmentations without cross-impact between different segments, step 370. The CUSM 300 only looks to customer categories in which sales are independent events to avoid covariance terms in the mathematical evaluation of the market model created by the promotion pricing system 100. In other words, sales to one consumer segment of the market should not ~~effect~~ affect demand from other consumer segments.

Replace paragraph [0032] the following paragraph:

Incentive ~~Typing~~ Translation Module 400

[0032] The ITM 400 collects and organizes data related to various promotional techniques. The ITM 400 may employ an incentive typing method 410, as illustrated in FIG. 4. In the incentive typing method 410, the ITM 400 collects incentive offers for promotion programs over certain time periods, step 420. The ITM 400 specifies different incentive types associated

with promotion programs for both the user's own target products and ~~competitors~~ competitors' products identified by the PSM 200. For instance, the incentives may include rebates, discounts, low-rate financing, bundled goods, etc.

Replace paragraph [0034] the following paragraph:

[0034] In another embodiment, the ITM 400 may further consider non-monetary promotions~~, step 440~~. For instance, the ITM 400 may add to the list of incentives non-monetary incentives such as prominent display or advertisement of the products. The non-monetary incentives ~~identified in step 400~~ may typically be specified by the user, prespecified in the ITM 400, or may be dynamically determined from transaction data.

Replace paragraph [0035] the following paragraph:

[0035] After the PSM 200, CUSM 300, and ITM 400 define the market to be modeled, the DAM 500 evaluates historical transactions in view of the various defined products, customers, and promotional techniques. Specifically, the DAM 500 may employ the data aggregation technique 510 depicted in FIG. 5. In step 520, the DAM 500 may separate data by customer segments. The separation may be automated or specified by the user. The DAM 500 may then determine a time interval at which to aggregate transaction volume data, step 530, on the basis of the number of time periods needed to estimate parameters, the incentive offer and price variation cycle, and data collection frequency. The DAM 500 then aggregates volume data at selected time intervals for target products, step 540. If the products are clearly

segmented, the DAM 500 aggregates competing product volume at the same time interval, and calculates corresponding market share under each segment, step 550. The DAM 500 then computes average prices and incentive offers by each channel for each product over each time interval, step 560. The DAM 500 then uses statistical analyses techniques to determine patterns, such as seasonality, and other statistical factors, step ~~580~~ 570. The output of the DAM 500 is typically a relational database in which each historical transaction has been characterized by product segment, customer segment, and incentive type.

Replace paragraph [0038] with the following amended paragraph:

[0038] If only samples of the user's and competitors' products volume data over time are available for the time period of interest, the MSM 600 evaluates the product segments defined in the PSM 200, step 650. At decision 660, the MSM 600 determines whether there is apparent cross impact among these segments. Likewise, at decision 670, the MSM 600 determines whether any of the promotion programs substantially overlap over different time periods of interest. If there is an apparent cross impact among these segments or any of the promotion programs substantially overlap over different time periods of interest, then the dependent variable during evaluation is sales volume, step 640, and the MSM 600 selects the multiplicative model for use during the promotion pricing system's 100 evaluation of promotional efforts, step 645. If there is neither an apparent cross impact among these segments nor substantial overlaps in promotions over different time periods of interest, then the MSM 600 uses market share as the dependent

variable during evaluation, step 680. The MSM 600 then decides whether there are too many products in each segment defined by the PSM 200, determination 690. Generally, the MSM 600 looks to see if the number of products in each segment exceeds a predetermined maximum. If there are too many products in each segment, the MSM 600 again selects the multiplicative model for use during the promotion pricing system's 100 evaluation of promotional efforts, step 645. If the MSM 600 determines that there are not too many products in each segment during determination 680, the MSM 600 selects an attraction model for use during the promotion pricing system's 100 evaluation of promotional efforts, step 695. The attraction model for evaluating promotions is described in greater detail below.

Replace paragraph [0039] with the following amended paragraph:

[0039] In evaluating a promotion, the subjective variable of attractiveness or utility does not really exist. To calibrate the model, the user may use Market Share (actually the natural logarithm of market share) or sales volume to represent the attractiveness, or utility, of the product i, deal type j. In particular, the CM 700 evaluates the above-described inputs and produces the outputs results using different models that guide the data analysis. For instance, the CM 700 may use either a multiplicative model that measures market share or sales volumes. Alternatively, the CM 700 may use an attraction model that measures market share. Specifically, the CM 700 determines the values for the dependent variables designated above in step 640 and 690. The CM 700 further integrates new transaction data to adjust values of the dependent variable. In turn, as

described below, the EM 800 uses the values for the dependent variables to access various promotional planning schemes. The operation of the CM 700 varies according to the model selected by the ~~CSM~~ MSM 600.

Replace paragraph [0050] with the following amended paragraph:

[0050] As can be seen from the above equations 2A-2D, the elasticity in the attraction model varies by market share and driver levels.

Replace paragraph [0057] with the following amended paragraph:

[0057] The EM 800 accesses the promotion scheme using the calibration results produced by the CM 700 in method 710. Specifically, the EM ~~100~~ 800 uses the evaluation method 810, as depicted in FIG. 8. During evaluation, the EM 800 receives baseline information from the user, including sales volume information for the attraction model, information of the user's promotions, and competitors to the related products ups, assuming the same promotions existing offers across customer segments, step 820. If the market share is predicted by the multiplicative model, the share elasticity should be evaluated instead of volume in step 820. The user may also input values for predicting variables to get responses for an adjusted program, though incentive offers to one customer segment could be distinctive from the other, step 830. For the attraction model, the user may input the total baseline volume Vi for the product over interest over the defined customer segments, the baseline volumes for other choice sets can be derived by market

shares and overall customer segment ratio as follows. For example,

$$r_i = V_{i1} / V_i = r * S_{i1} / [r * S_{k1} + (1 - r) * S_{i2}] \quad (7)$$

$$V_{j1} = V_{i1} * S_{j1} / S_{i1} = V_i * r * S_{j1} / [r * S_{i1} + (1 - r) * S_{i2}] \quad (8)$$

$$V_j = V_i * \lfloor r * S_{j1} + (1 - r) * S_{j2} \rfloor / [r * S_{i1} + (1 - r) * S_{i2}] \quad (9).$$

Replace paragraph [0062] with the following amended paragraph:

[0062] The EM 800 may also integrate with known market management applications to control inventory supply levels in a market through promotions, step 860. For instance, NetWORKS Market Manager™ produced by Manugistics, Inc. of Rockville, Md. provides a global view of all market activities that are happening for a product, location, or product family, simplifying the process of coordinating market activity information related to market promotions. In operation, EM 800 predicts and evaluates the ability of suggested promotions to ~~the to~~ predict the availability of the suggested promotion to achieve goals desired by the market management application

Replace paragraph [00123] with the following amended paragraph:

[00123] It should be appreciated that the configuration application 1440 may be implemented using multiple known methods. For instance, the configuration application 1440 may be a text editor or other similar application that allows users

to directly provide configuration data. Alternatively, the configuration application 1440 may be some type of GUI (graphical user interface) program through a Visual Basic window or through another programming language such as JAVA or C+. The configuration application 1440 may direct the user through a list of possible boundaries and constraints to be defined. The configuration application 1440 may further show defaults values to the user. A user may further use the configuration application 1440 to ~~other~~ direct the operation of the price optimization application 1410, as described in greater detail below.

Replace paragraph [00124] with the following amended paragraph:

[00124] In one embodiment, the configuration application 1440 may be used to direct the mathematical model or to define various boundaries or constraints to be considered by the price optimization application 1410. It should be appreciated that various mathematical models may be used in the analysis of a price optimization, depending on the desired results and the needs of the ~~used~~ user. The different models may be used depending on whether a pricing problem is unconstrained, bounded unconstrained, constrained, mixed-discrete non-linear, etc, and the various models used to address these optimization problems are described in greater detail below.

Replace paragraph [00127] with the following amended paragraph:

[00127] The Golden Section Search method operates such that given, at each stage, a bracketing triplet of points, the next

point to be tried ~~is~~ represents a fraction 0.38197 into the larger of the two intervals (measuring from the central point of the triplet). If starting with a bracketing triplet whose segments are not in the golden ratios, the procedure of choosing successive points at the golden mean point of the larger segment will quickly converge you to the proper, self-replicating ratios. Because this method is linearly convergent, the golden section search guarantees that each new function evaluation will (after self-replicating ratios have been achieved) bracket the minimum to an interval just 0.61803 times the size of the preceding interval.

Replace paragraph [00131] with the following amended paragraph:

[00131] In many pricing optimization models, the objective functions are obtained by regression, and the functions are not known until the regression. Hence, each value of functions is obtained by calling a parser of expression of functions which is a time-consuming process. Obviously, the exact first partial derivatives of functions are not known, either. To ~~be~~ approximate the gradient of functions, the parser has to be called multiple times to get multiple function values. This is impractically expensive, and to optimize a function with the properties listed above, the best choice is a direct search method. This kind of ~~methods~~ method has the important properties of using only function values and not using an approximate gradient.

Replace paragraph [00140] with the following amended paragraph:

[00140] The algorithm above is mainly for the unconstrained nonlinear problems without bounds for the variables. The initial vertices are chosen inside the bounds, then the centroid of the vertices is inside the bounds. By known computation, a new point inside the bounds may always be obtained for reflection, expansion and contraction. Also, the new vertices after performing a shrink step lie inside the bounds since all the previous vertices x_i(i=1, 2, . . . , n+1) lie inside the bounds.

Replace paragraph [00149] with the following amended paragraph:

[00149] The procedure of the SA algorithm is ~~composes~~ composed of four basic parts: Initialization, Melting Process, Annealing Process and Reannealing. Initialization is to set the parameters and assign some values to the variables. Melting process is to find an initial temperature which should be large enough to explore all feasible solutions. Also, a starting solution is selected during the melting process. Annealing process is to generate a number of random moves, decrement the temperature and finally to find a solution as the optimal solution of the problem. Reannealing process is to increase the annealing temperature and restart annealing process if the temperature is very low and the stopping criterion is not satisfied.

Replace paragraph [00153] with the following amended paragraph:

[00153] Therefore, some of the solutions generated are unusable and thus a portion of the computational time is not productive. In the latter approach, all neighborhood solutions are usable. The acceptance of a solution depends on the magnitude of the objective function value. The solutions which violate the constraints are expected to be rejected by its penalized objective function value. The larger the violation of the constraints in a solution, the higher is the probability of the solution being rejected. This penalty function approach is likely to lead to simpler neighborhood moves and a smoother topology. However, caution must be ~~excised~~ exercised in selection of the penalty function. A poorly defined penalty function leads to a worse final solution or even makes the algorithms not converge. Experience and some computational experiments are needed to find an appropriate penalty function for a specific problem.

Replace paragraph [00158] with the following amended paragraph:

[00158] If the value of the objective function $f_{p1}(x)$ attains zero at an x*, then the solution x* is a feasible point for the original optimization problem. The algorithm continues to Phase 2 to find the optimal solution. If the final value of $f_{p1}(x)$ is ~~great~~ greater than zero, then the original problem is ~~infeasible~~ unfeasible.

Replace paragraph [00160] with the following amended paragraph:

[00160] Thus, it can be seen that various different models may be used to address the various pricing optimization problems, depending on the user's needs. The configuration application 1440 allows the user to specify the model and to provide various input to direct the operation of ~~the~~ these models.

Replace paragraph [00161] with the following amended paragraph:

[00161] The configuration application 1440 may further be used by users to define the optimization conditions. Examples of this use are numerous, but examples may include the definition of a minimum inventory, thus constraining various optimization ~~calculating~~ conditions (i.e., the pricing optimization application cannot propose a profit maximizing price that depletes inventory stocks). In a similar fashion, the configuration application 1440 allows the user to define market conditions. For instance, the user may define cyclical sales cycles or needs that the pricing optimization application would not readily discover through the analysis of past sales. In another application, the configuration application 1440 may be used to define the relationship of different items, such that changes in the pricing of one item may ~~effect~~ affect sales of the second item. Overall, the configuration application 1440 allows users to easily define market characteristics. If the user does not define these conditions, the pricing optimization application 1410 may produce faulty results or may optimize using techniques to solve unbounded/unconstrained pricing problem.

Replace paragraph [00162] with the following amended paragraph:

[00162] In another embodiment, the configuration application 1440 may compare and display the price optimization results 1420 with and without the user's inputs. In this case, the user may compare the results and use the results to determine the accuracy/desirability of the changes supplied to the configuration application 1440. The user may similarly compare the computing resources required to solve an optimization application with and without the user defined conditions.